*Jamaica, W. I., climatological data, July, 1897.*

| | Morant Point Lighthouse. | Negril Point Lighthouse. | Kingston. | Kings House. | Castleton Gardens. | Hope Gardens. | Stony Hill Reformatory. | Hill Gardens (Cin. Plant.) |
|---|---|---|---|---|---|---|---|---|
| Latitude | 17°56′ | 18° 16′ | 17° 58′ | ...... | 18° 12′ | ...... | ...... | 18°05′ |
| Longitude | 76°10′ | 78° 23′ | 76° 48′ | ...... | 76° 50′ | ...... | ...... | 76°39′ |
| Elevation (feet) | 8 | 33 | 50 | 400 | 580 | 600 | 1,400 | 4,907 |
| Mean barometer, 7 a. m. | 29.955 | 29.959 | 29.965 | ...... | ...... | ...... | ...... | 25.248 |
| Mean barometer, 3 p. m. | 29.923 | 29.927 | 29.918 | ...... | ...... | ...... | ...... | 25.192 |
| Mean temperature, 7 a. m. | ...... | 78.9 | 77.5 | 73.7 | 73.0 | ...... | 73.3 | 63.0 |
| Mean temperature, 3 p. m. | ...... | 83.4 | 86.2 | 86.8 | 83.1 | ...... | 80.1 | 67.4 |
| Mean of maximum | ...... | 87.2 | 89.1 | 91.2 | 86.6 | ...... | 85.9 | 71.5 |
| Mean of minimum | ...... | 72.6 | 73.5 | 66.8 | 67.8 | ...... | 65.9 | 59.3 |
| Highest maximum | ...... | 90 | 92 | 96 | 91 | ...... | 90 | 75 |
| Lowest minimum | ...... | 70 | 71 | 63 | 60 | ...... | 65 | 56 |
| Mean dew-point, 7 a. m. | ...... | 72.7 | 69.4 | 70.7 | 69.6 | ...... | 69.8 | 57.8 |
| Mean dew-point, 3 p. m. | ...... | 74.7 | 72.5 | 77.9 | 75.8 | ...... | 74.2 | 62.1 |
| Mean relative humidity, 7 a. m. | ...... | 82 | 77 | 96 | 85 | ...... | 89 | 83 |
| Mean relative humidity, 3 p. m. | ...... | 75 | 65 | 74 | 77 | ...... | 82 | 84 |
| Monthly rainfall (inches) | 3.07 | 9.00 | 1.74 | 2.80 | 5.95 | 2.89 | 4.11 | 2.02 |
| Average daily wind movement | ...... | 217.2 | 94.6 | ...... | ...... | ...... | ...... | 17.9 |
| Average wind direction, 7 a. m. | ne. | n. e. | n. | ...... | ...... | ...... | ...... | ...... |
| Average wind direction, 3 p. m. | ne. | e. | se. | ...... | ...... | ...... | ...... | ...... |
| Average hourly velocity, 7 a. m. | 5.0 | 6.5 | 1.0 | ...... | ...... | ...... | ...... | ...... |
| Average hourly velocity, 3 p. m. | 7.0 | 10.4 | 7.3 | ...... | ...... | ...... | ...... | ...... |
| Average cloudiness (tenths): | | | | | | | | |
| 7 a. m., Lower clouds | 2.5 | 0.2 | 1.0 | ...... | ...... | ...... | ...... | ...... |
| 7 a. m., Middle clouds | 2.5 | 0.8 | 0.6 | ...... | ...... | ...... | ...... | ...... |
| 7 a. m., Upper clouds | 1.2 | 5.4 | 3.2 | ...... | ...... | ...... | ...... | .... |
| 3 p. m., Lower clouds | 2.8 | 4.2 | 2.6 | ...... | ...... | ...... | ...... | ...... |
| 3 p. m., Middle clouds | 1.8 | 3.9 | 1.3 | ...... | ...... | ...... | ...... | ...... |
| 3 p. m., Upper clouds | 1.4 | 0.8 | 3.6 | ...... | ...... | ...... | ...... | ...... |

For the summit of Blue Mountain at an elevation of 7,423 feet, the rainfall for July is 5.15.

In a note on the "Jamaica Weather Report for the month of June, 1897," Mr. J. F. Brennan shows that on the average for the whole island the rainfall for the current year has been as follows:

| Months. | Normal. | 1897. | Excess. | Accumulated excess. |
|---|---|---|---|---|
| | *Inches* | *Inches.* | *Inches.* | *Inches.* |
| January | 4.09 | 0.82 | − 3.27 | − 3.27 |
| February | 2.64 | 0.69 | − 1.95 | − 5.22 |
| March | 3.01 | 1.82 | − 1.19 | − 6.41 |
| April | 4.61 | 7.52 | + 2.91 | − 3.50 |
| May | 9.57 | 11.57 | + 2.00 | − 1.50 |
| June | 8.21 | 5.23 | − 2.98 | − 4.48 |

## EARTHQUAKE-PROOF BUILDINGS.

The great anxiety felt by those who live in countries subject to earthquakes has stimulated the application of our knowledge of seismology to the construction of buildings that shall be approximately proof against injury from earthquakes. The idea that it was possible to do this was defended by the English engineer, Mallet, who published a work on the dynamics of earthquakes in 1846, and whose views became especially popular after his elaborate report on the Neapolitan earthquake of 1857. He showed that the destruction of brick or stone buildings depended upon the way in which the elastic wave of compression issued from the crust of the earth, or rather upon the way in which the base of the building moved, while its top, by reason of its inertia, resisted motion. Of course the strain broke the building in its weakest joints, usually those of poor mortar, but often the weaker stones. From the cracks in the building, Mallet attempted to determine the nature of the shock and the origin of the earthquake, which he generally located between 3 and 10 miles below the earth's surface. Mallet established certain principles according to which buildings may be constructed, so that they shall be able to resist any shock that is likely to visit them, and his views have been applied to the construction of lighthouses, customhouses, and other important buildings. But since those days American engineers have devised a new style of building that was entirely unthought of in Europe twenty years ago, so that we now have four principal types of tall buildings that can withstand the ordinary shocks of earthquakes, viz:

1. Buildings of wooden or bamboo framework, where the parts are so bound together that the whole can sway to and fro like the masts of a vessel at sea.

2. Most solid masonry walls, whose bases are much broader than their summits, the walls and joints having a slope such that the emerging blow of the earthquake shock is likely to strike the joints at a safe angle.

3. Those in which the walls merely support their own weight, while the floors rest independently on their own columns of brick or, still better, of iron.

4. The so-called steel balloon frame, of steel columns and beams and girders, whose panels are filled in like a wall of brick or stone and whose floors are of brick and cement. The steel beams and columns are bound together as firmly as is the wooden framework in class No. 1, and the whole sways to and fro like an elastic mass.

## THUNDERSTORMS IN FRANKLINVILLE, N. Y.

The Editor has received from Dr. John W. Kales, voluntary observer at Franklinville, Cattaraugus Co., in western New York, the following description of the remarkably numerous thunderstorms that occurred in that region during the current month, and which seems worthy of record as illustrating one extreme feature of our climate:

The month of July was remarkable for the number of thunderstorms, excessive rainfall, high temperature, and damage caused by lightning.

The station is in a valley surrounded by hills from 400 to 600 feet high. It is 1,598 feet above sea level, in latitude 42° 20′ N., longitude 78° 29′ W. The valley is about 1¼ miles wide (in fact an old lake bed) 30 miles long, and extends northeast by southwest. An elevated plateau, about 500 feet high, lies southwest. The prevailing winds are southwest. The thunderstorms occurred as in the following table:

| Date. | Time of beginning. | Time of ending. | Rainfall. | Direction of wind. | Max. temperature. | Remarks. |
|---|---|---|---|---|---|---|
| 2 | 11:00 a. m. | 2:00 p. m. | .14 | nw. | 81 | |
| 4 | 4:00 p. m. | 5:00 p. m. | .04 | s. | 96 | Highest temperature on record here. |
| 5 | 2:00 p. m. | 1:00 a. m. | 1.21 | s. veered to nw. | 94 | Three people injured, 1 killed; house wrecked by same flash of lightning at 5 p. m. |
| 10 | 6:30 p. m. | 6:30 p. m. | .00 | s. | 93 | Distant thunder in northeast. |
| 11 | 3:00 p. m. | 10:00 a. m. | 2.00 | sw. veered to n. | 88 | Tornado and hail. |
| 13 | 7:00 p. m. | 7:00 p. m. | T. | s. | 78 | Distant thunder in west. |
| 14 | 8:00 p. m. | 4:30 p. m. | .26 | w. | 72 | Distant thunder at 2 p. m., west. |
| 18 | 7:00 a. m. | ........... | .01 | s. | 83 | Thunder at 3 p. m. |
| 19 | 2:00 p. m. | 3:20 p. m. | .76 | s. | 82 | .51 inch rain fell in 12 minutes. |
| 20 | 9:00 a. m. | 3:00 p. m. | .21 | s. | 81 | Hail. |
| 22 | During | night .... | .14 | se. | 84 | Thunder at 5 p. m. |
| 23 | 2:00 a. m. | 4:00 p. m. | .32 | w. | 73 | Thunder at 2 p. m. |
| 26 | Rained | 3 days.... | ...... | s. | 80 | Thunderstorm at 6 p. m. |
| 30 | 5:45 p. m. | 6:45 p. m. | T. | w. | 81 | |
| 31 | 10:00 p. m. | 10:00 p. m. | .00 | w. | 75 | |

Of the fifteen thunderstorms that of the 5th was remarkable. It appeared to form in the hills to the southwest. Enormous masses of black clouds formed, thunder rolled without cessation and shook the hills. Streams of lightning played along the crests of the hills for miles. At 5 p. m. a flash extended across the southwest horizon more than 90°. This flash of lightning injured 3 persons at Ischua, 6 miles distant; killed a child at Sugartown, 6 miles distant; and wrecked a dwelling at Ashford, 10 miles away. These three places are in a line extending across the elevated plateau.

On the 11th another thunderstorm formed in the hills west of the station, and at 3 p. m. came through "the narrows" (an opening in the hills half a mile west of the station), where it developed into a tornado. Here a strong southwest wind caught the storm and swept it up the west side of the valley in plain view. The loud roar was plainly heard as the wind swept along the hillsides. Lightning fired a barn, burned another, knocked a chimney off a house, and shivered trees. The wind uprooted trees in its course, and changing to north, drove the storm down the valley again. At 2 p. m. on the 19th a dark cloud formed in the southeast and passed directly over the station. At 3 p. m. a terrific peal of thunder, without visible lightning, occurred. This was followed by rain. In twelve minutes 0.51 inch of rain fell. Then a second peal of thunder occurred, not as loud as the first. The rain ceased, and in a few moments the sun was shining in noonday splendor. On the 20th a black cloud formed in the north and a similar cloud formed in the northwest. These clouds met on the hills west of the station and 450 feet above it (measured by barometer). When they met, hail commenced to fall, at 3 p. m., and continued about half an hour. The hail lay inches deep on the ground and remained into the night. Some people gathered hail by the pailfull and froze ice cream with it. This hail and that of the 11th damaged growing crops and thrashed growing peas. During a residence of thirteen years I have not observed a similar month of thunderstorms, and have no desire to see it repeated.

## RECENT EARTHQUAKES.

On June 20, 1897, at 8:30:29 a. m., at Port au Prince, an earthquake shock. At first a horizontal stroke coming from the east, and two seconds afterward a stroke from the northeast, lasting three seconds. After an interval of two seconds a nearly vertical shock occurred, followed by another of the same character but less intense. At 8:31:30 a last feeble, horizontal shock came from the north. Small movements of the earth were indicated by the Bertelli tromometer until 9 a. m. The preceding data are taken from the curves traced by the Cecchi seismograph and are communicated by Dr. P. J. Scherer, director of the observatory at Port au Prince, Hayti, in connection with his meteorological report for this month. (The observatory is located at N. 18° 34′, W. 71° 21′; altitude, 37.20 meters.)

July 25, Castle Pinckney, slight. [This may be the same as the following.—Ed.]

July 26, San Francisco, 5:40 p. m. (8:40 eastern time) a sharp, short, and heavy earthquake, preceded by a low rumbling sound. No damage is reported. At the Weather Bureau office, in the Mills Building, Mr. A. G. McAdie registered the time as 5:40:35; the trembling lasted about two seconds; the motion was apparently in a vertical direction.

## KITES AT THE CHICAGO CONFERENCE, AUGUST, 1893.

In previous pages of the MONTHLY WEATHER REVIEW the Editor has collected a number of items illustrating the early use of the kite for meteorological investigations. The recent development of this subject can, probably, only be written after searching through many popular and technical journals. In order to assist our readers, and to complete our collection of data on this subject, the Editor will occasionally review the items published in some of these journals.

The International Conference on Aerial Navigation, held in Chicago, August 1–4, 1893, under the auspices of the Columbian Exposition, seems to have originated in a suggestion by Prof. A. F. Zahm, of Notre Dame University, in Terre Haute, Ind., and forms an important epoch in the history of the use of the kite in America. The proceedings of this conference were published in a series of papers appended to the American Engineer and Railroad Journal, but which also appeared separately, as Vol. I of Aeronautics, a proposed periodical which, however, stopped with No. 12 of that volume, which was published in September, 1894. They were rearranged and printed in a volume of proceedings, in 1895. The conference, and the wide publication of its proceedings, owes its success largely to the devotion of the famous Engineer, Mr. Octave Chanute, of Chicago, who was chosen chairman, and Prof. A. F. Zahm, who was chosen secretary of the committee, to organize and carry out the project.

The attendance at each session comprised about 100 persons who seemed to take great interest in the proceedings, and discussions brought out several investigators who had been studying the subject or trying interesting experiments without making it publicly known.

The following items referring to kites are taken from Vol. I of Aeronautics; the rest of that magazine is mostly occupied with discussions relative to flight by birds and aeroplanes, the pressure of the wind on inclined surfaces, and other correlated matter.

On page 43 will be found the memoir of Prof. Langley on "The Internal Work of the Wind," which had been read by title in April, 1893, but now in full at this meeting of the International Conference, where it excited great attention and discussion. Among the items brought out in the discussion of this first publication of this memoir were the interesting communications from Professor Marvin, page 87, and Professor Zahm, page 99.

The gustiness of the wind has been an object of study for the past two centuries, but it was reserved for the professors of the Weather Bureau to show that, inasmuch as we do not measure gusts with an apparatus that has no inertia, we must, therefore, attempt to compute the gusts and their effects by the use of several anemometers simultaneously that differ among themselves only in their inertia. Professor Marvin, therefore, had in 1888 devised and constructed several forms of light paper hemispherical or conical cups, such that the moment of inertia of the revolving mass was but a small fraction of that of the ordinary metallic anemometer. He also introduced the aluminum cups whose moment of inertia is quite small. With such apparatus he determined the effect of gustiness on the ordinary anemometer records, both at the City of Washington and on the summit of Mount Washington, and deduced the formula and tables, published by the Weather Bureau in 1889 and recommended for ascertaining the true velocity from that indicated by the Robinson anemometer. These ingenious paper cups and the results of Marvin's work, being known to the late Mr. G. E. Curtis of the Weather Bureau, had by him been brought to the notice of Professor Langley, who, through the Chief of the Weather Bureau, obtained Professor Marvin's apparatus for use in his observations, as detailed on page 45 of Langley's memoir. To the present Editor it seems that, in order to measure the gusts which affect kites and do such great destruction in tornadoes, we must employ either the suction anemometer, as was explained in his lectures of 1882, and his Treatise of 1887, or the paper apparatus constructed by Professor Marvin, and described by him in the American Meteorological Journal, April, 1889, Vol. V, page 556. In general, the less the inertia of the measuring apparatus is called forth so much the shorter and more violent are the recorded gusts and variations in the wind—at least near the surface of the ground where measurements must be taken; but the infinite irregularity of these gusts and eddies can best be perceived by watching the flotation of motes in the sunbeam in still air, or thistle down and snowflakes in ordinary winds.

On page 71 Mr. Carl Myers, of Frankfort, N. Y., states that—

> I constructed some kites with a flexible backbone and which when released would advance relatively against the wind, that is, they would not drift back as fast as the wind blew. An account of some of these kite experiments will be found in the Scientific American Supplement (No. 835) for January 2, 1892.

On page 72 Prof. J. B. Johnson, of Washington University, St. Louis, states his belief that the gusts recorded by Professor Langley are not typical, and explains how he has "tested the gustiness of the ordinary atmospheric movements by observing the column of smoke from a tall chimney."

On page 82 Mr. William A. Eddy, of Bayonne, N. J., in a letter dated January 11, 1894, describes the "soaring aeroplane kite." He states that he—

> Had heard of the buoyancy of the malay kite, but was unable to get measurements showing its construction, when in 1890 he began the